APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/510,078	12/14/2004	Mark Berman	267-88	4230

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EXAMINER
PARK, EDWARD

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☐ Responsive to communication(s) filed on _____.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>1-11</u> is/are pending in the application.

     4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>1-11</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on <u>04 October 2004</u> is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

     a) ☒ All   b) ☐ Some * c) ☐ None of:

         1. ☐ Certified copies of the priority documents have been received.

         2. ☐ Certified copies of the priority documents have been received in Application No. _____.

         3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

     * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
     Paper No(s)/Mail Date <u>10/4/04, 9/7/07</u>.

4) ☐ Interview Summary (PTO-413)
     Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1.   The following is a quotation of 37 CFR 1.75(a):

> The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

2.   **Claim 6** is objected to under 37 CFR 1.75(a), as failing to conform to particularly point out and distinctly claim the subject matter which application regards as his invention or discovery. The term, "tolerance", is not supported in the preceding claim 1 and therefore does not have antecedent basis. Is the tolerance part of the data? Is the tolerance associated with the estimation? Is the tolerance regarding the relative change? For examination purposes, the tolerance will be associated with the relative change. Further clarification is needed.

3.   **Claims 1, 2, 5 and 11** objected to because of the following informalities: It appears the mentioned claims have typographical errors.

In regards to **claim 1**, in lines 14, 15, the word, "regularised", appears to be a typographical error and should be corrected to "regularized".

In regards to **claim 2**, in line 1, the word, "regularised", appears to be a typographical error and should be corrected to "regularized".

In regards to **claim 5**, in lines 1, 3, the word, "regularised", appears to be a typographical error and should be corrected to "regularized".

In regards to **claim 11**, in line 2, the word, "minimisation", appears to be a typographical error and should be corrected to "minimization".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5.   **Claims 1, 4, 5** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 1 and 5, the claims call for the element, "regularized residual sum of squares is sufficiently small". The phrase, "sufficiently small" deems the claim to be vague and indefinite. What is constitutes the regularized residual sum of squares to be sufficiently small? Is there a threshold that needs to be met? Is the value .8, sufficiently small? Is the value .0001 sufficiently small? For examination purposes, the broadest interpretation will be utilized to examine the claim limitation of "sufficiently small", which is any value. Further clarification and correction is required.

Regarding claim 4, the claim calls for the element, "starting estimates are well separated". The phrase, "well separated", deems the claim to be vague and indefinite. How far must the estimates be to be "well separated"? Is 1 micrometer well separated? Is one mile well separated? For examination purposes, the broadest interpretation will be utilized to examine the

claim limitation of "well separated", which is any value or distance. Further clarification and

correction is required.

Claim Rejections - 35 USC § 101

6.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or
> any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and
> requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent
Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Section IV.C,
reads as follows:

> While abstract ideas, natural phenomena, and laws of nature are not eligible for patenting, methods and products
> employing abstract ideas, natural phenomena, and laws of nature to perform a real-world function may well be.
> In evaluating whether a claim meets the requirements of section 101, the claim must be considered as a whole to
> determine whether it is for a particular application of an abstract idea, natural phenomenon, or law of nature,
> rather than for the abstract idea, natural phenomenon, or law of nature itself.

> For claims including such excluded subject matter to be eligible, the claim must be for a practical application of
> the abstract idea, law of nature, or natural phenomenon. Diehr, 450 U.S. at 187, 209 USPQ at 8 ("application of a
> law of nature or mathematical formula to a known structure or process may well be deserving of patent
> protection."); Benson, 409 U.S. at 71, 175 USPQ at 676 (rejecting formula claim because it "has no substantial
> practical application").

> To satisfy section 101 requirements, the claim must be for a practical application of the Sec. 101 judicial
> exception, which can be identified in various ways:

> > The claimed invention "transforms" an article or physical object to a different state or thing.

> > The claimed invention otherwise produces a useful, concrete and tangible result, based on the factors
> > discussed below.

7.   **Claims 1-11** are rejected under 35 U.S.C. 101 because the claimed invention is directed

to non-statutory subject matter as follows.   Claims 1-11 recite the mere manipulation of data or

an abstract idea, or merely solves a mathematical problem without a limitation to a practical

application.   A practical application exists if the *result* of the claimed invention is "useful,

concrete and tangible" (with the emphasis on "result") (Guidelines, section IV.C.2.b).   A

"useful" result is one that satisfies the utility requirement of section 101, a "concrete" result is

one that is "repeatable" or "predictable", and a "tangible" result is one that is "real", or "real-

world", as opposed to "abstract" (Guidelines, section IV.C.2.b)). Claims 1-11 merely

manipulates data without ever producing a useful, concrete and tangible result. The claims

provide a method that processes data by estimating image data values, mixing proportions,

spectrum values, and repeats these steps until a condition is met. These steps constitute a pure

manipulation of data without ever producing a tangible result.

In order to for the claimed product to produce a "useful, concrete and tangible" result,

recitation of one or more of the following elements is suggested:

- The manipulation of data that represents a physical object or activity transformed

  from outside the computer.

- A physical transformations outside the computer, for example in the form of pre

  or post computer processing activity.

- A direct recitation of a practical application;

Applicant is also advised to provide a written explanation of how and why the claimed invention

(either as currently recited or as amended) produces a useful, concrete and tangible result.

Claim Rejections - 35 USC § 102

8.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless —

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this
or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9.   **Claims 1-4, 7-11** are rejected under 35 U.S.C. 102(b) as being anticipated by Keshava et al ("Spectral Unmixing", IEEE Signal Processing Magazine).

Regarding **claim 1 (as best understood)**, Keshava discloses a method of identifying endmember spectra values from multispectral image data, where each multispectral data value is equal to a sum of mixing proportions of each endmember spectrum, said method including the steps of:

processing the data to obtain a multidimensional simplex having a number of vertices equal to the number of endmembers, the position of each vertex representing a spectrum of one of the endmembers (see p. 53, left column, paragraph 3 – p. 53, right column, paragraph 1, estimates of endmember spectra may be derived from the vertices of the multifaceted simplex that tightly encloses the data and has the same number of endmembers as vertices)

wherein processing the data includes: providing starting estimates of each endmember spectrum for each image data value (see p. 51, right column, paragraph 2 - p. 52, left column, paragraph 1 define a suite of image endmembers (selected from the image data), an image endmember is obtained by locating a pixel in the scene with the maximum abundance of the physical endmember it will represent);

estimating the mixing proportions for each data value from estimates of the spectra of all the

endmembers (see p. 54, right column, paragraph 1, endmember determination is often

interrelated with estimating the abundance vector, a, in the LMM (linear mixing model));

estimating the spectrum of each endmember from estimates of the mixing proportions of the

spectra of all the endmembers for each image data value (see p. 50, right column, paragraph 2 -

p. 54, left column, last paragraph, geometric endmember determination ... estimates of

endmember spectra may be derived from the vertices of the multifaceted simplex that most

tightly encloses the data and has the same number of endmembers as vertices);

repeating estimation steps until a relative change in the regularized residual sum of squares is

sufficiently small, the regularized residual sum of squares including a term which is a measure of

the size of the simplex (see p. 54, left column, paragraph 3 - right column, paragraph 1; p. 54,

right column, paragraph 1, estimates of endmember spectra may be derived from the vertices of

the multifaceted simplex that most tightly encloses the data and has the same number of

endmembers as vertices which is an optimization known as shrinkwrapping .... basis for arriving

at estimates is a distance metric that is minimized ... some quantity related to squared-error

(estimation is implicitly disclosed by minimization requiring repetition of estimations)).

Regarding **claim 2**, Keshava discloses sum of the squared distances between all of the

simplex vertices (see p. 54, right column, paragraphs 1-5 least squares method .... estimates is a

distance metric that is minimized).

Regarding **claim 3**, Keshava discloses choosing starting points with a high pixel purity

index score (see p. 51, right column, paragraph 2, scene with the maximum abundance of the

physical endmember it will represent).

Regarding **claim 4**, Keshava discloses starting estimates are well separated (see figure 8b, pg. 51, right column, paragraph 2, scene with the maximum abundance of the physical endmember it will represent).

Regarding **claims 7, 8**, Keshava discloses whitening the data which includes conducting a transform of the data into data that is not band correlated (see p. 49, left column, last paragraph, principle component analysis ... statistical models for the noise in their construction of a signal transform, maximum noise fraction or noise adjusted principle components).

Regarding **claim 9**, Keshava discloses removing bands that do not have a high signal to noise ratio (see p. 49, left column, paragraph 2 – right column, last paragraph; maximum noise fraction or noise adjusted principle components .... identify and order the components of the received signal processing the maximum SNR).

Regarding **claim 10**, Keshava discloses utilizing a linear estimation technique (see p. 48, right column, paragraphs 1-5, exploiting the LMM through dimension reduction, endmember determination, and inversion).

Regarding **claim 11**, Keshava discloses utilizing a quadratic programming minimization technique (see p. 55, left column, paragraph 2, minimizing while maintaining falls in the domain of quadratic programming with linear inequalities as constraints).

Claim Rejections - 35 USC § 103

10.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11.   **Claims 5 and 6** are rejected under 35 U.S.C. 103(a) as being unpatentable over Keshava et al ("Spectral Unmixing", IEEE Signal Processing Magazine).

In regards to **claims 5 and 6 (as best understood)**, Keshava discloses all elements as mentioned above in claim 1.

Keshava does not disclose expressly a ratio of successive values of regularized residual sum of squares is less than a tolerance and a tolerance is 0.99999.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have a ratio of successive values of regularized residual sum of squares is less than a tolerance and a tolerance is 0.99999. Applicant has not disclosed that a ratio of successive values of regularized residual sum of squares is less than a tolerance and a tolerance is 0.99999 provides an advantage, is used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with either a regularised residual sum of squares being sufficiently small as taught by Keshava in claim 1 or a ratio of successive values of regularized residual sum of squares is less than a tolerance and a tolerance is 0.99999 because both utilize the regularised residual sum of squares which performs the same function of minimizing the error of the endmember spectra values.

Therefore, it would have been obvious to combine to one of ordinary skill in this art to

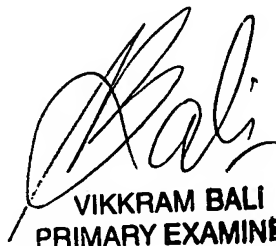modify Keshava to obtain the invention as specified in claims 5 and 6.

Conclusion

12.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Edward Park whose telephone number is (571) 270-1576. The

examiner can normally be reached on M-F 10:30 - 20:00, (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Vikkram Bali can be reached on (571) 272-7415. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

like assistance from a USPTO Customer Service Representative or access to the automated

information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Edward Park
Examiner
Art Unit 2624

/Edward Park/

VIKKRAM BALI
PRIMARY EXAMINER